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Studies on the Rocky Mountain flora — XXIV

PER AXEL RYDBERG

Saussurea densa (Hook.) Rydb. sp. nov.

Saussurea alpina densa Hook. Fl. Bor.-Am. 1: 303. 1833.

Saussurea alpina Ledebouri A. Gray, Syn. Fl. 1²: 397. 1884.

Not *S. Ledebouri* Herder, 1810.

Saussurea Ledebouri Herder was based on *S. subsinuata*, *S. nuda*, and *S. Tilesii* of Ledebour, which Herder united into one species under another name. All three are illustrated in Ledebour's *Icones Fl. Ross.*, and it is evident that *S. alpina densa* Hook. is different from each of them. None of the three illustrations shows the elongated, acuminate outer bracts, characteristic of *S. densa*. Only *S. nuda* shows a dense inflorescence with subsessile heads and a low stem, but the heads are fewer and less crowded, the stem is naked above, and the leaves entire.

S. densa is a plant of the higher mountains of the Canadian Rockies.

Saussurea remotiflora (Hook.) Rydb. sp. nov.

Saussurea alpina remotiflora Hook. Fl. Bor.-Am. 1: 303. 1833.

Saussurea alpina A. Gray, Syn. Fl. 1²: 396, in part. 1884.

Saussurea nuda Britt. & Rydb. Bull. N. Y. Bot. Gard. 2: 187. 1901. Not *S. nuda* Ledeb. 1829.

This species is nearer to *Saussurea subsinuata* Ledeb. than to either *S. alpina* or *S. nuda*, but the inflorescence is laxer and the involucre is different, judging from Ledebour's illustration. *S. remotiflora* grows on low ground from northern Saskatchewan to Yukon and Alaska.

CARDUUS

So many species of thistles have lately been described from the Rocky Mountains that the number has more than doubled since the issue of Gray's Synoptical Flora. Some of these species should be reduced to synonymy and some of them are probably hybrids, but I think that the larger number will remain as good

species. It seems as if it should be unnecessary to propose more, but it has been impossible for me to include the following four in any known species.

***Carduus polyphyllus* sp. nov.**

Carduus scopulorum Rydb. Mem. N. Y. Bot. Gard. 1: 449. 1900.

Not *C. scopulorum* Greene. 1892.

Perennial; stem stout, 3–8 dm. high, very leafy, angled, arachnoid-hairy; leaves 1–2 dm. long, linear in outline, deeply pinnatifid, with lanceolate divisions ending in yellow spreading spines, green on both sides, sparingly arachnoid-hairy; heads hemispheric, about 3 cm. high and broad, usually numerous, sessile in the axils of the leaves, often forming a leafy spike 2–3 dm. long; bracts linear-subulate, densely arachnoid-hairy, the outer with rather long yellow spines often 1 cm. long, the inner attenuate into slender straight tips; corollas straw-colored; pappus plumose with slender, barbellate tips.

In my Flora of Montana, I referred this species to *Carduus scopulorum* Greene. The latter was based on *Cnicus eriocephalus* or *Cirsium eriocephalum* A. Gray, the type of which was collected by Parry in Colorado. The rather common Colorado plant is characterized by its leaves, which are grayish-tomentose beneath, and by its heads conglomerate at the end of the stem, forming a cluster which at first is nodding. *Carduus polyphyllus* is more closely related to *C. Kelseyi* and *C. Tweedyi*. From the latter it differs in the straw-colored instead of red corollas, the narrower bracts, and more numerous leaf-lobes, and from the former in the deeply dissected and decidedly crisp leaves. If the leaves are lobed at all in *C. Kelseyi* the spines are directed forward and the blades are almost perfectly flat.

MONTANA: Mountains near Indian Creek, July 21, 1897, Rydberg & Bessey 5216 (type, in herb. N. Y. Bot. Gard.); Park Co., Aug., 1887, Tweedy 349.

***Carduus Butleri* sp. nov.**

Perennial or biennial; stem angled, striate, purple, sparingly arachnoid-hairy, very leafy, 6–10 dm. high or more; leaves linear-ob lanceolate or linear, almost entire or sinuately lobed, spinulose-ciliate and if lobed the short lobes ending in slightly stronger spines, green and sparingly arachnoid above, grayish-tomentose

beneath; heads few, ending the stem and short branches, subtended by narrowly linear spinulose-ciliate leaves, hemispheric, about 4 cm. high, 4-5 cm. wide; outer bracts lanceolate, brownish, glabrous or nearly so, ending in short weak spines 2-3 mm. long, the innermost linear-lanceolate, attenuate, ending in slender brownish or purplish somewhat twisted and spreading lance-linear tips, these neither dilated nor erose; corollas pinkish; pappus plumose; tips more or less clavate.

This species resembles *Carduus Kelseyi* and *C. foliosus* in the leaves, but differs from both in the scattered few heads and purplish stem. In both species mentioned, the heads are conglomerate at the end of the stem. In *Carduus Kelseyi* the involucre bracts are much narrower and decidedly arachnoid. In *C. foliosus* the bracts are somewhat broader than in *C. Butleri*, the inner ones have dilated, lanceolate and erose tips, and the leaves are usually more lobed.

MONTANA: Big Fork, July 28, 1908, *B. T. Butler*, 674 (type, in herb. N. Y. Bot. Gard.); also near Rost Lake, 677.

***Carduus lacerus* sp. nov.**

Probably biennial; stem stout, 6-10 dm. high, sparingly arachnoid, angled and striate; lower leaves oblanceolate, 2-3 dm. long, pinnatifid, with rather broad, ovate or lanceolate divisions ending in weak spines, glabrous or slightly long-hairy and green above, grayish tomentose beneath; upper leaves lanceolate, sessile and clasping, with somewhat narrower lobes and rather stout spines; heads more or less clustered, about 4 cm. high and broad; outer bracts ovate-lanceolate, glabrous, without glutinous ridge, ending in short stout spreading spines 3-5 mm. long; inner bracts with dilated, ovate, abruptly acuminate, erose and crisp, spreading tips; corollas rose-colored; pappus plumose; tips slightly clavate.

This species was probably included in *Cnicus scariosus* by Gray, judging from his description in the Synoptical Flora; but it is not *Cirsium scariosum* Nutt., for Nuttall characterized the latter as having arachnoid-hairy involucre, the bracts with dilated erose tips, and the leaves tomentose beneath. I know of only one species which agrees with this characterization. This is well represented by *Flodman* 880, which was distributed as *Carduus Hookerianus*.

UTAH: Wahsatch County, near Midway, July 6, 1905, *Carlton*

& *Garrett 6732* (type, in herb. N. Y. Bot. Gard.); apparently also, Salt Lake City, August, 1880, *M. E. Jones 1905*, and the same locality, Sept., 1905, *A. O. Garrett 1718*.

***Carduus olivescens* sp. nov.**

Perennial; stem slender, somewhat tinged with purple, more or less floccose, 4–8 dm. high, leafy; leaves linear in outline, 1–2 dm. long, densely white-tomentose beneath, loosely floccose above, deeply pinnatifid, with numerous lanceolate, often 2- or 3-cleft lobes, ending in short yellow spines; heads few, peduncled, about 3 cm. high, 3–3.5 cm. wide; bracts slightly floccose on the margins, light olive-colored, darker towards the apex, ending in yellow spines 2–4 mm. long, or the innermost with lance-linear, slightly twisted yellowish tips; corollas straw-colored; pappus plumose; tips slightly clavate.

This species was first determined questionably as *Carduus Tracyi*, to which it is not closely related, not having the conspicuous broad glutinous dorsal ridges or the broad bracts of that species. In leaf-form it resembles somewhat *C. pulcherrimus*, although the upper surface is more floccose, but otherwise it is not close to that species.

УТАН: Aquarius Plateau, August 5, 1905, *Rydberg & Carlton 7450* (type, in herb. N. Y. Bot. Gard.).

Thistle hybrids are very common in Europe and even tertiary hybrids have been reported. No attempt has been made in this country to segregate or recognize hybrids in this genus. As a rule specimens of thistles are not so common in herbaria as would be expected, probably owing to the difficulty in collecting and preparing them.

Thistles are not uncommon in the Rocky Mountains, especially in Colorado. No person has perhaps contributed more to the knowledge of these plants of that state than Mr. George E. Osterhout, of New Windsor, Colorado. He has described a few species himself and others have been described from material collected by him. There are still more forms recognized by him and distributed under manuscript names, but which he has been reluctant to describe. With the aid of the material sent me by him, augmented by other specimens collected by Baker, Shear, Clements, myself, and others, it has been possible to recognize

a good many forms which I regard as hybrids. The two species which seem to have produced the most hybrids are *Carduus americanus* (A. Gray) Greene (not Rydb.) and *C. griseus* Rydb. The former of these is comparatively common in Colorado, but the latter is rather rare. Several of the specimens cited under the latter in my Flora of Colorado do not belong to it, but are hybrids of *Carduus americanus* and various species. The original of *C. griseus* and later specimens collected by Osterhout do not have the bracts dilated at all or erose; the spines of the involucre bracts are long and somewhat flattened, and the leaves are darker and less deeply divided than in *C. americanus*. The following probable hybrids have been recognized, but, like Mr. E. P. Bicknell, in the matter of *Rubus* hybrids,* we wish "to divest the subject from all nomenclatorial claims" and "to be understood merely as pointing out the probability of the occurrence of the hybrids mentioned."

CARDUUS AMERICANUS X GRISEUS

This has the leaves of *C. griseus*, *i. e.* dark green above, grayish-tomentose beneath and with short lobes, as well as the strong and broad spines of the involucre bracts of that species, and some of the outer bracts are spinulose-ciliate; but most of the bracts are erose on the margins and the inner ones have dilated tips as in *C. americanus*. The following specimens are to be referred here:

COLORADO: Toland, Gilpin Co., July 20, 1906, *Osterhout* 3266; Ward, Boulder Co., July 17, 1901, *Osterhout* 2429.

The former of these was labeled by Osterhout *Carduus erosus* Rydb. (?). The original *C. erosus* is quite different. To strengthen the probability of hybridity, it may be mentioned that Mr. Osterhout has sent in specimens of one of the supposed parents, *viz.*, *C. griseus*, also from Toland, Gilpin Co., collected on the same date, his 3267, the next number, and that *C. americanus* is a rather common plant in Colorado.

The latter of the two specimens was determined by me as *C. griseus*, although I now regard it as a hybrid of that species and *C. americanus*. *C. americanus* has been collected at Ward, by Tweedy.

* Bull. Torrey Club 37: 399. 1910.

CARDUUS AMERICANUS \times SPATHULATUS

This resembles most *C. americanus* in habit and leaf-form; the bracts are somewhat erose on the margins as in that species, but they are scarcely at all dilated, and if so only the innermost, and they are tipped with the short and broad spines characteristic of *C. spathulatus*. To this are referred:

COLORADO: Estes Park, Aug. 16, 1905, *Osterhout 3091*; Sulphur Springs, July 16, 1905, *Osterhout 3057*; Happy Hollow, July 14, 1898 (collector not given), Herb. State Agric. College, no. 2801.

The last was distributed as *Carduus griseus* and has perhaps given rise to a wrong impression of that species. *C. spathulatus* was then undescribed and the bracts excluded no. 2801 from *C. americanus*. We have no specimens of either of the supposed parents, from exactly the same locality, but *C. americanus* is found nearly everywhere in the mountains of northern Colorado, and Osterhout in the original description of *C. spathulatus* states that it is common on both sides of the range of mountains east of the North Park.

CARDUUS AMERICANUS \times COLORADENSIS

Carduus erosus Rydb. Bull. Torrey Club 28: 507. 1901.

This was originally described as a distinct species. Professor Nelson reduces it to a synonym of *Carduus americanus*. The broad hemispheric head, the broad bracts with less dilated tips, and the more spiny leaves with more numerous and lanceolate lobes are very different from those of the typical *C. americanus*. The form and structure of the involucre, the form of the leaves, and the habit approach those of *C. coloradensis*. The upper surface of the leaves and the midrib beneath show some of the arachnoid hairs characteristic of *C. coloradensis* and its allies. We have no specimens of the two supposed parents from Durango, the type locality of *C. erosus*, but the locality is not without the range of either.

COLORADO: Durango, 1896, *F. Tweedy 517*.

CARDUUS ACAULESCENS \times AMERICANUS

This resembles most *C. americanus*, but the stem is lower, the heads crowded, the involucre bracts elongated and less dilated

at the tip, the leaves have more lanceolate lobes and stronger spines, and the stem and midribs of the leaves are more or less arachnoid-hairy. The clustered heads, the arachnoid pubescence on the stem, and almost glabrous bracts, with broad bases gradually tapering upwards, would suggest *C. acaulescens* as the other parent.

COLORADO: Plains and foothills near Boulder, July, 1903, *Tweedy* 5852.

CARDUUS ACAULESCENS \times COLORADENSIS

Carduus acaulescens (A. Gray) Rydb. and *C. coloradensis* Rydb. are closely allied and many regard them as forms of the same species. As they often grow together and intermediate forms are found, this disposition seems plausible, but these intermediate forms may as well be explained by hybridity. The typical *C. acaulescens* has practically no stem and the small campanulate heads, seldom more than 3 cm. wide, are sessile and congregated in a flat-topped head-like cluster, while the typical *C. coloradensis* has a stem 3–10 dm. high and the larger heads are more or less peduncled, 4–7 cm. broad, hemispheric, and scattered. The intermediate forms are usually low-stemmed and the heads, intermediate in size and shape, are in a dense flat-topped cluster at the end of the stem. At the south end of Fish Lake, Utah., *C. acaulescens* and *C. coloradensis* were found together by myself and Mr. Carlton and the specimens in the New York Botanical Garden bear the numbers 7547 and 7546, respectively. The supposed hybrid also was collected, although I can not find any specimens now in the collection of the New York Botanical Garden. They may have met the same fate as some other specimens of the collection in being damaged by rain. There is one specimen, however, in our herbarium, which I regard as belonging to this hybrid, viz.

COLORADO: Sulphur Springs, Grand Co., Aug. 8, 1907, *Osterhout* 3615.

CARDUUS ACAULESCENS \times SCOPULORUM

Carduus crassus Osterhout, MS.

This was distributed under the manuscript name cited above and regarded by Osterhout as a distinct species. I am inclined

to think it a hybrid of the two species mentioned for the following reasons. The form and the pubescence of the leaves are almost exactly those of *Carduus acaulescens*. The small and clustered heads also suggest that species; but the plant has an evident stem and the involucre is decidedly arachnoid-hairy. As *C. scopulorum* and *C. Parryi* are the only species in Colorado which have arachnoid involucre, one of these may be supposed to be the other parent. As *C. Parryi* has also dilated erose bracts, it must be thrown out of consideration. In *C. crassus* the involucral bracts have also the long slender spines characteristic of *C. scopulorum*.

COLORADO: Sulphur Springs, Grand Co., July 17, 1905, *Osterhout* 3042.

Neither of the two supposed parents is represented by specimens from Sulphur Springs, but there is a specimen, *Osterhout* 3615, just cited above, which I regard as a hybrid of *C. acaulescens* with another species.

CARDUUS GRISEUS × LATERIFOLIUS

Carduus canalensis Osterhout, MS.

This I included in *Carduus griseus* in my Flora of Colorado but it differs in many respects from the type of that species, the leaves being much broader and less lobed, the upper leaves with broad auricles and the inner bracts with dilated erose tips. These two characters suggest *C. laterifolius*, from which it differs in the long and broad spines of the outer bracts, characteristic of *C. erosus*.

COLORADO: Canyon of Thompson River, Larimer County, August 16, 1905, *Osterhout* 3089.

This specimen was collected together with the type number of *C. laterifolius*, viz., *Osterhout* 3090 (the next number).

CARDUUS GRISEUS × SCOPULORUM

Carduus Osterhoutii Rydb. Bull. Torrey Club **32**: 131. 1905.

This has the habit, the leaf form, and the long flat spines of the bracts of *Carduus griseus*, but the inflorescence is conspicuously arachnoid-hairy as in *C. scopulorum* and the leaf segments are rather more numerous than in *C. griseus*. The following specimens belong here:

COLORADO: Red Cliff, Eagle Co., July 17, 1902, *Osterhout* 2706 ; Tennessee Pass, July 28, 1902, *Osterhout* 2640.

The first of these specimens was associated with *Carduus griseus*, *Osterhout* 2707 (the next number), collected at the same date and locality. *C. griseus* was collected at Red Cliff in 1906 also, *Osterhout* 3362. *C. scopulorum*, the other supposed parent, is rather common throughout the mountains of Colorado.

CARDUUS GRISEUS × PARRYI

Carduus araneosus *Osterhout*, Bull. Torrey Club **32**: 612. 1905.

Osterhout in the original description of *Carduus araneosus* suggests the relationship with *C. Parryi*. *C. araneosus* differs from that species mainly in the less greenish corollas, the stouter and broader spines of the bracts, and the grayish under surface of the leaves. These characters suggest *C. griseus*, but the involucre bracts are decidedly arachnoid-pubescent and the inner bracts are more or less dilated above and erose. The following specimens belong here:

COLORADO: Red Cliff, Eagle Co., June 26, 1900, *Osterhout* 2169; and also Aug. 16, 1906, *Osterhout* 3363; Boreas, July 24, 1897, *Crandall* 2806; without locality, *J. Wolf* 459 (Wheeler Exp.).

The first two specimens were collected at Red Cliff, where also two numbers of *C. griseus* (see under preceding hybrid) and one of *C. Parryi*, viz., *Osterhout* 2708, were collected.

CARDUUS OREOPHILUS × SCOPULORUM

This resembles *C. scopulorum* in the heads crowded at the ends of the stem, the arachnoid involucre and general habit; but the leaves are broader, with fewer lobes; the involucre bracts are broader at the base, and the flower-cluster not nodding. In these characters it approaches *C. oreophilus*, but it has less deeply dissected leaves with broader lobes, and the inflorescence is much more arachnoid.

COLORADO: Silver Plume, Aug. 23, 1895, *Shear* 4948 and 4960.

Carduus oreophilus also was collected at Silver Plume the same day by *Shear*, no. 3258, and also by *Rydberg* on the following day. *C. scopulorum* is common in the upper part of Clear Creek above Silver Plume. In the herbarium of the Garden there is one speci-

men from near Gray's Peak, *Shear* 4734, collected on the same date as 4948 and 4960.

CARDUUS COLORADENSIS × UNDULATUS

With the specimen cited below, Mr. Osterhout sent a slip of paper on which is written: "Do not think this is *Carduus undulatus* — do not know what it is." It resembles *C. undulatus*, the flowers being red, although paler, the bracts having a glandular dorsal ridge, and the general habit and leaf-form being similar, but the dorsal ridge is very inconspicuous. It resembles perhaps more *C. coloradensis* in habit, in the form of the bracts, and the lanceolate twisted tips of the innermost of these. There is also an indication of arachnoid hairs on the stem, but the corollas are pink, not dirty white, and there is an evident though narrow dorsal ridge towards the ends of the bracts.

COLORADO: Wolcott, Eagle Co., July 11, 1902, *Osterhout* 2653.

Mr. Osterhout collected also *C. coloradensis* at the same date and locality, viz., 2651.

CARDUUS FILIPENDULUS × OCHROCENTRUS

Carduus dispersus Osterhout MS.

This has the large heads and the long spines of *C. ochrocentrus* but the broad non-decurrent leaves and dark green glabrate upper surfaces of *C. filipendulus*.

COLORADO: Home, Larimer Co., July 29, 1904, *Osterhout* 2898.

Both of the supposed parents are common in Larimer County. Mr. Osterhout doubts that this can be a hybrid between the two supposed parents given above, as he has not seen either growing so far up in the mountains.

CARDUUS FLODMANII × MEGACEPHALUS

This specimen cited below was determined as *Carduus Flodmanii*, but its leaves are much broader and with shorter and broader lobes, the heads are larger, and their bracts more glutinous than in the typical *C. Flodmanii*. The plant is almost exactly intermediate between that and *C. megacephalus*.

COLORADO: Fort Collins, July 30, 1904, *Osterhout* 2903.

Both of the supposed parents are common around Fort Collins.

CARDUUS PLATTENSIS \times UNDULATUS

The specimen cited below was sent me by Mr. Osterhout, who suggested that it was a hybrid of *Carduus plattensis* Rydb. and *C. undulatus* Nutt. It has the head of the former, but somewhat smaller and with narrower and less viscid bracts. The leaves also are those of that species but approach those of *C. undulatus*.

COLORADO: Thompson's River, Larimer Co., Aug. 16, 1905, Osterhout 3087.

There are many features that suggest hybridity in *Carduus perplexans* Rydb. In the original description, attention was directed to its relationship to *C. Centaureae* (= *C. americanus* Greene) and also to the *C. altissimus* group. At that time I was inclined to regard it as a hybrid between *C. americanus* and *C. filipendulus*, but the broad leaves seemed to contradict such a disposition.

Since that time I have been inclined to regard it as a hybrid of *C. laterifolius* Osterhout and *C. filipendulus*, as the former has broad leaves resembling those of *C. perplexans*. The bracts, erose-tipped as they are, are not much like those of *C. laterifolius*. Mr. Osterhout suggests that it might be a hybrid of an undescribed species, specimens of which he has sent me. In these the bracts resemble those of *C. perplexans* very much and the flowers are also red; but the leaves are narrow and deeply pinnatifid. This species and *C. filipendulus* could scarcely produce a hybrid like *C. perplexans*.

All the supposed hybrids given above were collected in Colorado. Besides these the following are in the herbarium of the New York Botanical Garden from neighboring states.

CARDUUS MEGACEPHALUS \times OCHROCENTRUS

There seem to be two rather distinct forms included in *Carduus ochrocentrus*. As both are found in Texas and New Mexico and I have not seen the type specimen, I am uncertain which of the two is *C. ochrocentrus* proper. One of them extends northward to Nebraska and northern Colorado and is the only one found within the range of my studies. For the present I regard this as *C. ochrocentrus*, until further information can be had. It is characterized by strongly decurrent and strongly spinose, crisp leaves,

with numerous short crowded lobes and densely white-tomentose beneath. The spines of the involucre bracts are also long and strong, in age usually strongly spreading. *C. megacephalus*, which resembles it in many respects, has much broader flatter leaves, with fewer lobes and short spines, scarcely decurrent and at least the upper ones with broad clasping bases. The spines of the involucre are also short and weak. The following two specimens have leaves resembling those of *C. ochrocentrus* but not decurrent and have involucre bracts with the short weak spines of *C. megacephalus*.

NEBRASKA: Banner County, July 6, 1891, *Rydberg 215a*.

KANSAS: Plains, Ellis County, July 16, 1895, *Hitchcock 309*.

The first of these was collected with *Carduus megacephalus*, *Rydberg 215*. *C. ochrocentrus* was common in the region. *Rydberg 214*, belonging here, was collected a few miles further south. There are also forms intermediate between *C. megacephalus* and *C. undulatus*, but as these two species are so closely related that it is almost impossible to draw a line between them, I have not tried to distinguish any hybrids.

CARDUUS FOLIOSUS × SCOPULORUM

This has the habit and bracts of *Carduus foliosus*, but the involucre is densely arachnoid as in *C. scopulorum* and the leaves have more numerous and crowded lobes, in that respect approaching those of the latter species.

WYOMING: Big Horn Mountains, Aug., 1899, *Tweedy 2120*.

Carduus scopulorum was evidently growing near it, for a specimen belonging to it and collected by Tweedy bears the number 2122. *C. foliosus* is common in the Big Horn Mountains. Among others are *Tweedy 3051*, collected there the following year.

Carduus Tweedyi, judging from the scarcity of the plant and from the fact that it combines the characters of two groups, may also be a hybrid. A plant of its type may be produced by the crossing of *C. polyphyllus* and a red-flowered species such as *C. Macounii* or *C. edulis* but neither of these two has been found east of the continental divide and *C. Tweedyi* not west of it. A somewhat similar plant would be produced by the crossing of *C. scopulorum* and *C. Eatoni*, but I have seen no specimens of the latter outside of Utah.

CARDUUS BUTLERI×KELSEYI

The leaves of the two supposed parents are very similar, so the differences are mostly found in the inflorescence and the involucre bracts. See under the description of *Carduus Butleri*.

The supposed hybrid has the inflorescence of *C. Kelseyi*, the bracts of *C. Butleri*, but slightly arachnoid-hairy.

MONTANA: Rost Lake, July 28, 1908, *Butler* 703.

Carduus Butleri was collected at the same locality and on the same date, *Butler* 677; and *C. Kelseyi* three days later a little higher up in the mountains, *Butler* 398.

CARDUUS EATONI×OLIVESCENS

Cnicus Eatoni A. Gray included several forms. Three of these had been distinguished by D. C. Eaton, who, however, had applied wrong names for two of them. The first of the three Eatonian synonyms cited by Dr. Gray is *Cirsium eriocephalum* var. *leiocephalum*. Dr. Gray's description also applies principally to this. Hence *Carduus leiocephalus* (D. C. Eaton) Heller becomes a synonym. *Cirsium foliosum* D. C. Eaton, I think, is the same as *Carduus nevadensis* Greene and *C. Drummondii* D. C. Eaton is a Nevada plant, almost identical with *C. oreophilus* of Colorado.

The supposed hybrid under consideration resembles *C. Eatoni* in general habit, but the leaves have fewer and deeper lobes and are grayish tomentose beneath, and the involucres have shorter and weaker spines. It differs from *C. olivescens* in the broader segments of the leaves, the narrower bracts, of which the outer are spinulose-ciliate as in *C. Eatoni*.

UTAH: Aquarius Plateau, Aug. 4, 1905, *Rydberg & Carlton* 7422.

Carduus olivescens also grew on the Aquarius Plateau. The type of it was collected the following day and bears the number 7450. *C. Eatoni* is common in the same region, although Carlton and myself did not preserve any specimens from the Aquarius Plateau.

CARDUUS PULCHELLUS×UNDULATUS

This most resembles *Carduus pulchellus* in habit, but the involucres are more hemispheric instead of truly campanulate, the bracts are broader and with a narrow glutinous ridge, and the inner

ones are not so elongated as in that species. From *C. undulatus* it differs in the narrower segments of the leaves, the glabrate upper surface of the same, the somewhat purple-tipped inner bracts, and the inconspicuous dorsal ridge.

UTAH: Fish Lake, near Twin Creeks, Aug. 8, 1905, *Rydberg & Carlton* 7499 and 7487; Beaver City, 1877, *Palmer* 273.

COLORADO: Grand Junction, June 15, 1900, *Mrs. Stokes*.

Neither of the supposed parents was collected at the same date and locality, but both are found in Utah and Colorado. *C. pulchellus* was collected by Carlton and myself in the neighborhood of Marysvale, nos. 7016 and 7179.

A good deal can be said about the treatment of this genus in the New Manual of Botany of the Central Rocky Mountains. Many of the species, reduced to synonymy, have little or no relationship to those of which they were made synonyms.

Under *Carduus americanus* we find the following synonyms: *C. Centaureae* Rydb., *C. erosus* Rydb., and *C. griseus* Rydb. The first is a pure synonym. When the name was proposed I was following the Madison amendments of the "Rochester Code," and according to those amendments an older varietal name invalidated the name *C. americanus*. *C. erosus* I now think is a hybrid of *C. americanus* and *C. coloradensis*. *C. griseus*, on the contrary, is a good species, easily distinct from *C. americanus*, and its bracts have no dilated erose tips. In my Flora of Colorado I included in it at least two hybrids of *C. americanus* with this species and related ones. This may have given Professor Nelson a wrong idea of *C. griseus*.

Under *Carduus Hookerianus* we find as a synonym *C. Osterhoutii*. *C. Hookerianus* is, so far as I know, not found within the United States. It is from the Saskatchewan region. I, as well as others, have referred specimens from Colorado to it, but all these belong to a form of *C. scopulorum*. This may have been the reason why Nelson has made the latter a variety of *C. Hookerianus* under the name *C. Hookerianus eriocephalus*. *C. Osterhoutii* is not closely related to *C. Hookerianus*, but more so to *C. scopulorum*. I think it is a hybrid of that species and *C. griseus*.

Under *Carduus Hookerianus eriocephalus* we find the follow-

ing synonyms: "*Cnicus eriocephalus* Gray, *Carduus scopulorum* Greene l. c., *C. Tweedyi* Rydb. l. c., *C. araneosus* Osterh. * * * *C. Eatonii* Gray, * * * *C. canovirens* Rydb. l. c. (?) *C. pulcherrimus* Rydb." Of these the two first are pure synonyms. *Carduus Tweedyi* is a related red-flowered species (see page 552). *C. Eatonii*, as I understand it and limited to *C. eriocephalus* var. *leiocephalus* D. C. Eaton, is a good species, forming a group by itself. *C. araneosus* is not related to *C. scopulorum* but to *C. Parryi*, as Osterhout suggested, and is probably a hybrid of that species and *C. erosus*. *C. canovirens* and *C. pulcherrimus* do not belong even near *C. scopulorum*, but to the *C. undulatus* group. *C. canovirens* has no very close relative. The nearest is perhaps *C. canescens* (Nutt.). Nelson once thought it a good species, distributed it under a manuscript name, and would have published it, if his attention had not been called to the fact that it was already published. *C. pulcherrimus* is most closely related to *C. ochrocentrus* and stands to that species nearly in the same relationship as *C. undulatus* does to *C. megacephalus*.

Under *Carduus foliosus* are found the following synonyms: *C. scariosus* (Nutt.) Heller and *C. coloradensis* Rydb. Judging from Nuttall's original description of *Cirsium scariosum*, it is not at all related to *Carduus foliosus* Hook. See remarks above under *C. lacerus*. *Carduus coloradensis* is not to be referred to *C. foliosus*. It was based mainly on *Cnicus Drummondii* of the Synoptical Flora, and is apparently the same as *Carduus Drummondii* of the New Manual, the corolla of which is described as white. The original *Cirsium Drummondii* T. & G., of which there is a duplicate in the Torrey herbarium, has rose-purple corollas. The only specimens I have seen from the United States, are from the Black Hills of South Dakota. All the others are from British America.

Carduus oreophilus Rydb. is given as a synonym under *C. Drummondii*. From what is just stated it may be seen that it is not the original *C. Drummondii* and a comparison between my description in the Bulletin of the Torrey Botanical Club and that of *C. Drummondii* in the New Manual shows that it is not *C. Drummondii* as understood by Professor Nelson. *C. oreophilus* is very local and many things suggest a hybrid, but I have failed

to find two species that would produce a combination of characters found in *C. oreophilus*. A mixture of four species, *C. pulchellus*, *C. spathulatus*, *C. scopulorum* and *C. coloradensis* might do it. I think therefore that it is best to regard it at present as distinct.

Under *Carduus bipinnatus* (Eastw.) Heller, in the New Manual, we find: *C. pulchella*[us], *C. truncatus* Greene(?) and *C. spathulatus* Osterh. The only true synonym is *C. truncatus* Greene. *C. pulchellus* is related to it, but the leaves are white-tomentose beneath. *C. spathulatus* Osterhout is related to *C. griseus*, though its involucre bracts are much shorter. The plant resembles closely *C. americanus*, but the bracts are not at all fimbriate.

Carduus Tracyi Rydb. is, in the New Manual, made a synonym of *C. Nelsonii* Pammel (Pammel did not use the generic name *Carduus* and the page is wrongly cited), while the latter is kept distinct from *C. plattensis* Rydb.

A botanist with broad limitations of species might regard *Carduus plattensis*, *C. Nelsonii*, *C. Tracyi*, *C. brevifolius*, and *C. palousensis* as one species. They are all closely related but each has a definite range of its own. *C. plattensis* belongs to the sandy regions of Nebraska, Kansas, and northeastern Colorado; *C. Nelsonii*, as far as I know, is found only in Wyoming; *C. Tracyi* in southern Colorado; *C. brevifolius* in Wyoming and Montana; and *C. palousensis* in western Idaho and eastern Washington and Oregon. *Carduus Nelsonii* and *C. plattensis* are the most closely related of the four; the only difference I can find is that *C. plattensis* has the inner bracts prolonged into linear lanceolate, spreading, more or less crisp tip, a character not found in the rest. The characters given by Nelson in the key to distinguish *C. Nelsonii* and *C. plattensis* are useless, because the characters assigned to the latter are not true.

Under *Carduus filipendulus* (Engelm.) Rydb., in Coulter & Nelson's New Manual, are given as synonyms: *C. Flodmannii* Rydb. and *C. oblanceolatus* Rydb. The description of *C. filipendulus* is a verbatim copy of my description of *C. Flodmannii*. Little could be said against this, if the two were the same, but this is not the case. In the key, Professor Nelson distinguishes *C. filipendulus* from *C. undulatus*, *C. megacephalus*, and *C. ochrocentrus* by the characters: "Leaves becoming

green and glabrate on the upper side" against "Leaves permanently tomentose on both sides." The glabrate character is correct as far as *C. filipendulus* is concerned and was the reason why Dr. Gray associated it with *C. altissimus*; but it is not true of *C. Flodmanii*, for in that species the tomentum is as permanent as in *C. undulatus* and *C. ochrocentrus* and far more so than in *C. megacephalus*. In the key *C. filipendulus* is characterized, but the description is of *C. Flodmanii* under a wrong name. Dr. Gray included *C. Flodmanii* in his *Cnicus undulatus canescens*.

Professor Nelson has admitted a variety *Carduus undulatus canescens* (Nutt.) Porter. Evidently this was unknown to him for he simply copies Gray's characterization of *Cnicus undulatus canescens*. Some years ago, while visiting the Gray herbarium, I was curious to see what Gray meant by this variety. I found that it contained a mixture of *Carduus Flodmanii*, *C. oblanceolatus*, another related species of Arizona, and *Cirsium brevifolius* Nutt. The last is a yellow-flowered species related to *Carduus Nelsonii* and *C. plattensis*, and antedates both. Of these *C. Flodmanii* agrees best with the description of *Cirsium canescens* Nutt., and it might be that species. I have seen, however, a specimen of another species with strong erect involucre spines, which bore the name *Cirsium canescens* in Nuttall's own handwriting. Whether that specimen was the type or not I do not know, but I have adopted the name *Carduus canescens* for that species. Pammel in his treatise on the Iowa thistles adopted the name *Cnicus canescens* for *Carduus Flodmanii*. If Nelson had followed him, I would not have made any criticism, as there is some doubt as to which the name *canescens* belongs to, *C. Flodmanii* or the species for which I have adopted it.

Professor Nelson has also omitted all the Utah species described by Marcus E. Jones, although most of them belong to the range of the New Manual.

CENTAUREA and ARCTIUM

Neither of these two genera are included in the New Manual, although *C. Cyanus* has been collected at several places in Montana, *C. solstitialis* L. at Salt Lake City, Utah, and *A. minus* Schk. in Colorado.